

What is claimed is:

1 1. An optical scanning device for scanning a plurality of light beams on one or more scanned
2 surfaces, the optical scanning device comprising:

3 a light source for emitting said plurality of light beams;

4 a front optical system for receiving said plurality of light beams from the light source
5 along an optical axis that extends within the optical scanning device;

6 a deflector for receiving said plurality of light beams from said front optical system and
7 for deflecting said plurality of light beams in a first direction so that said plurality of light beams
8 scan in said first direction;

9 a rear optical system for receiving said plurality of light beams from said deflector and for
10 directing said plurality of light beams toward the one or more scanned surfaces so that said
11 plurality of light beams are separated farther in a second direction that is orthogonal to said first
12 direction within said rear optical system than at said deflector;

13 wherein

14 two light beams of said plurality of light beams are deflected by said deflector so that said
15 two light beams travel parallel to one another in a plane that includes said second direction
16 between said deflector and said rear optical system; and

17 other light beams of said plurality of light beams that are deflected by said deflector enter
18 said rear optical system so that other light beams progressively separate from one another in said
19 plane.

1 2. The optical scanning device of claim 1, wherein:

2 said front optical system includes, in order from the light source side, a first optical
3 system for collimating each of said plurality of light beams and a second optical system for
4 converging each of said plurality of light beams at least in said second direction.

1 3. The optical scanning device of claim 1, wherein:

2 said rear optical system includes, in order from the light source side, a third optical
3 system for converging in said first direction each of said plurality of light beams deflected from
4 said deflector, a separation optical system for separating said plurality of light beams in said
5 second direction after they pass through said converging optical system, and a fourth optical
6 system for converging each of said plurality of light beams at least in the second direction after
7 they pass through said separation optical system.

1 4. The optical scanning device of claim 2, wherein:

2 said rear optical system includes, in order from the light source side, a third optical
3 system for converging in said first direction each of said plurality of light beams deflected from
4 said deflector, a separation optical system for separating said plurality of light beams in said
5 second direction after they pass through said converging optical system, and a fourth optical
6 system for converging each of said plurality of light beams at least in the second direction after
7 they pass through said separation optical system.

1 5. The optical scanning device of claim 4, wherein said third optical system includes at least one
2 cylindrical lens having refractive power at least in said first direction.

1 6. The optical scanning device of claim 5, wherein said at least one cylindrical lens includes, in
2 order from the light source side, a first cylindrical lens having negative refractive power in said
3 first direction and a second cylindrical lens having positive refractive power in said first
4 direction.

1 7. The optical scanning device of claim 6, wherein said other light beams intersect in said plane
2 between said second optical system and said deflector.

1 8. The optical scanning device of claim 7, wherein said other light beams enter said rear optical
2 system at positions in said plane that are outside said two light beams.

1 9. The optical scanning device of claim 8, wherein:

2 said deflector includes plural reflecting surfaces that deflect said plurality of light beams;

3 and

4 said two light beams are reflected by said plural reflecting surfaces at right angles in said
5 plane and enter said third optical system at right angles in said plane.

1 10. The optical scanning device of claim 8, wherein:

2 said plurality of light beams includes, in order in said second direction, first, second,
3 third, and fourth light beams that are deflected by said deflector so that said second and third
4 light beams are parallel in said plane;

5 said second cylindrical lens includes first and second lens parts that are adjacent to one
6 another in said second direction;

7 the first lens part includes a first light incident surface that is inclined at an angle in said
8 plane so that the sum of the absolute values of the angles that the first and second light beams
9 make with said first light incident surface is equal to the sum of the absolute values of the angles
10 that the first and second light beams would make with said first light incident surface if said first
11 light incident surface were perpendicular to the center optical axis of said third optical system;
12 and

13 the second lens part includes a second light incident surface that is inclined at an angle in
14 said plane so that the sum of the absolute values of the angles that the third and fourth light
15 beams make with said second light incident surface is equal to the sum of the absolute values of
16 the angles that the third and fourth light beams would make with said second light incident
17 surface if said second light incident surface were perpendicular to the center optical axis of said
18 third optical system.

1 11. The optical scanning device of claim 8, wherein:

2 said plurality of light beams includes, in order in said second direction, first, second,
3 third, and fourth light beams that are deflected by said deflector so that said second and third
4 light beams are parallel in said plane;

5 said second cylindrical lens includes first and second lens parts that are adjacent to one
6 another in said second direction;

7 the first lens part includes a first light incident surface that is inclined at an angle in said
8 plane so that the first light beam produces a straight scanning line; and

9 the second lens part includes a second light incident surface that is inclined at an angle in
10 said plane so that the fourth light beam produces a straight scanning line.

1 12. The optical scanning device of claim 4, wherein said fourth optical system includes a
2 cylindrical mirror that has refractive power at least in said second direction.

1 13. The optical scanning device of claim 5, wherein said fourth optical system includes a
2 cylindrical mirror that has refractive power at least in said second direction.

1 14. The optical scanning device of claim 6, wherein said fourth optical system includes a
2 cylindrical mirror that has refractive power at least in said second direction.

1 15. The optical scanning device of claim 1, and further including a plurality of scanned surfaces
2 wherein each scanned surface is on a different one of a plurality of photosensitive drums, and
3 each of said plurality of light beams scans one of said plurality of scanned surfaces.

1 16. The optical scanning device of claim 2, and further including a plurality of scanned surfaces
2 wherein each scanned surface is on a different one of a plurality of photosensitive drums, and
3 each of said plurality of light beams scans one of said plurality of scanned surfaces.

1 17. The optical scanning device of claim 4, and further including a plurality of scanned surfaces
2 wherein each scanned surface is on a different one of a plurality of photosensitive drums, and
3 each of said plurality of light beams scans one of said plurality of scanned surfaces.

1 18. The optical scanning device of claim 5, and further including a plurality of scanned surfaces
2 wherein each scanned surface is on a different one of a plurality of photosensitive drums, and
3 each of said plurality of light beams scans one of said plurality of scanned surfaces.

1 19. The optical scanning device of claim 6, and further including a plurality of scanned surfaces
2 wherein each scanned surface is on a different one of a plurality of photosensitive drums, and
3 each of said plurality of light beams scans one of said plurality of scanned surfaces.

1 20. The optical scanning device of claim 7, and further including a plurality of scanned surfaces
2 wherein each scanned surface is on a different one of a plurality of photosensitive drums, and
3 each of said plurality of light beams scans one of said plurality of scanned surfaces.